

Corrections to Hansen's Tables de la Lune. By James Gordon.

(Communicated by the Rev. S. J. Johnson, M.A.)

I have reviewed Professor Newcomb's "Researches on the Motion of the Moon," part 1, and I have accepted his graphical interpolation of the individual corrections to the Moon's mean longitude for intervals of a quarter of a century. I then throughout gave each equation of condition the weight of unity, as I look with suspicion on assigning different weights to the observations. I took out from the theory all of Hansen's terms of long period due to the action of the planets on the Moon, and substituted an inequality of long period, which goes through precisely the same changes in 2831 years, and is made up of the two composite periods of $257\frac{4}{11}$ years and 149 years respectively. This inequality depends upon the distance of the Moon from the plane of the Sun's equator, when the Moon arrives at conjunction with the Sun. The following is the correction to the Moon's mean longitude which I have determined:—

$$\delta\epsilon = \delta v + \delta n z.$$

In which

$$\delta v = +0''.23 - 29''.35 T - 3.976 T^2.$$

And

$$\delta n z = -(V_1 + V_2 + M) + (14''.1 \sin A + 0''.9 \sin A')$$

in which T is the number of centuries from the epoch of Hansen's Tables, viz.: January 0.0 1800; δv is the correction to the Moon's true longitude, and $\delta n z$ to that of the fundamental argument. The terms V_1 , V_2 , and M are the values assigned by Hansen in the respective tables, xlii., xli., and xl., with the arguments 31, 30, and 29. The outstanding residuals are as follows:—

1625	+ 2''.1	1725	- 1''.4	1825	- 0''.2
1650	- 2.4	1750	- 1.4	1850	+ 0.8
1675	- 0.4	1775	+ 1.0	1875	- 0.5
1700	+ 0.1	1800	+ 0.7		

I have calculated a table at five-years intervals between A D 1600 and A D 2000 inclusive; of the values of $\delta\epsilon$, which represents the correction to the Moon's mean longitude; and it is a well-known fact that Hansen, being unable to determine the coefficients of his *Venus* terms, from theory, assigned such values to them as brought observation and theory into agreement during the period 1750–1850, but this he only attained by sacrificing accuracy before and after this interval. Now, if my corrections to the Moon's mean longitude are well founded, they ought to

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approach zero during the above interval. The following table gives the correction $\delta\epsilon$ for the interval 1750–1850:—

Epoch.	Corr.	Epoch.	Corr.	Epoch.	Corr.
1750	+ 1".5	1785	− 0".9	1820	+ 0".3
1755	+ 1".1	1790	− 1".3	1825	0.0
1760	0.0	1795	− 1".3	1830	+ 0.5
1765	− 0.7	1800.	− 0.5	1835	+ 0.6
1770	− 0.5	1805	− 0.6	1840	0.0
1775	− 1.0	1810	− 0.6	1845	− 0.2
1780	− 1.8	1815	− 0.1	1850	− 0.4

I then made a selection of 105 of the best of the equations of condition formed from the occultation of stars given in Professor Newcomb's "Researches on the Motion of the Moon." The terms, however, of $\frac{dD}{de} \delta\epsilon + \frac{dD}{db_0} \delta b_0 = a$ became known by substituting the value for $\delta\epsilon$ as taken from my table, and for δb_0 I took the mean constant value = + 1".76 as found for it by Professor Newcomb (see the "Researches," part 1, page 235); this enabled me to bring the equations of condition to the form—

$$\frac{dD}{ed\varpi} e\delta\varpi + \frac{dD}{id\theta} i\delta\theta + \frac{dD}{d\pi} \delta\pi = s' - D - a.$$

And these I reduced down by least squares in a single group, the resulting normal equations coming out to be as follows:—

$$\begin{aligned} + 3.56 e\delta\varpi - 0.14 i\delta\theta - 0.79 \delta\pi &= - 1".88 \\ - 0.14 &+ 0.07 &+ 0.03 &= + 0.45 \\ - 0.79 &+ 0.03 &+ 0.53 &= + 0.42 \end{aligned}$$

the solution of which gives

$$\begin{aligned} e\delta\varpi &= - 0".3 \\ i\delta\theta &= + 5".83 \end{aligned}$$

and

$$\delta\pi = 0.0$$

As $e = 0.055$, and $i = 0.0898$, we have for the middle epoch through which the equations extend, viz. A D 1711.6

$$\begin{aligned} \delta\varpi &= - 5".4 = \text{Correction to the longitude of perigee.} \\ \delta\theta &= + 64.9 = \text{,, ,, ,, node.} \end{aligned}$$

While $\delta\pi$, the correction to the Moon's parallax, is zero, or, in other words, Hansen's tables require no correction for this element.

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Now, in Professor Newcomb's "Investigation of Corrections to Hansen's Tables de la Lune," 1876, he gives for—

$$1861 \quad \delta\varpi = +2''.2$$

and

$$1868 \quad \delta\theta = +4.5$$

Comparing this with my own determination, I have arrived at the following corrections to the motions of the perigee and node, in which T represents as before the number of centuries from the epoch 1800 :—

$$\delta\varpi = -0''.9 + 5''.09 T$$

and

$$\delta\theta = +30.75 - 38.6 T$$

I have confined myself entirely to modern observations, as the problem of the secular acceleration of the Moon's mean motion is in a very unsettled state. What is aimed at by astronomers is to obtain a constant coefficient progressing according to the square of the time, and this they will never obtain for any great length of time, as the very causes which give rise to this acceleration are not of a constant nature.

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On the Best Form of Mounting for a Large Reflector.
By A. A. Common, LL.D., F.R.S.

A silver on glass mirror of eight or nine feet aperture seems now to be possible, and it becomes worth while to consider the best way to mount such a mirror for astronomical purposes.

Opinions will differ as to the optical arrangements most suitable, but the Newtonian form seems, in my opinion, to be the best, for many reasons that it is not necessary to go into now.

The best use of such an enormous telescope would probably be to explore and discover, and this would naturally be best done by using it as a visual telescope, for which purpose a focal length of about twelve times the aperture would perhaps be most suitable, giving for the smaller mirror above mentioned some ninety-six feet focal length.

To mount such a telescope equatorially and put a dome over it in the usual way would be a most costly undertaking, and even if the money were available it is very doubtful if any form of equatoreal would be the most suitable. The difficulty of providing access to the eye end for the observer, and of following the movement, especially when we remember that off the

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